4.0 ENVIRONMENTAL ANALYSIS

This section describes the affected environment as it currently exists (baseline conditions) and discusses the environmental consequences of the proposed Project. This section also discusses the environmental consequences of amending the BLM's CDCA Plan to allow for an exemption to the Energy Production and Utility Corridors Element of the plan as well as the environmental consequences of amending the Yuma District Plan to allow North Baja to cross the Milpitas Wash SMA. The discussion is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, special management areas, recreation and public interest areas, and aesthetic resources; socioeconomics; transportation and traffic; cultural resources; air quality; noise; reliability and safety; cumulative impacts; growth-inducing impacts; and environmental justice. The No Project Alternative has also been analyzed in this section for each of these major resource topics.

In accordance with BLM Manual guidance (H-1790-1), the major resource sections address the following "critical elements of the human environment:" air quality; ACECs; cultural resources; Native American religious concerns; prime or unique farmlands; floodplains; rangeland health; threatened and endangered species; hazardous or solid wastes; drinking and groundwater quality; wetlands and riparian zones; Wild and Scenic Rivers; Wilderness Areas; socioeconomics; environmental justice; health and safety risks to children; and invasive, non-native species. These critical elements are based on requirements specified in statute, regulation, or executive order.

The environmental consequences of constructing and operating the North Baja Pipeline Expansion Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impact could continue for up to 3 years following construction. Impact was considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the Project.

The specific criteria used to determine the significance of an impact are presented at the beginning of each major resource section. Unless otherwise noted, all identified impacts are considered to be potentially significant adverse impacts before applying North Baja's proposed mitigation. If any impacts remain significant (i.e., continue to exceed the significance criteria) after North Baja implements its proposed mitigation measures, the FERC and CSLC staffs developed additional mitigation in an effort to reduce any significant impact to a less than significant level. In some cases, although an impact would not be considered significant, the FERC and CSLC staffs developed additional mitigation in an effort to further reduce impacts. These recommended mitigation measures appear offset with bold type in the text. The FERC and CSLC staffs will recommend to their respective Commissions that these additional mitigation measures be included as specific conditions to any approvals issued by the FERC and the CSLC, as appropriate, for the North Baja Pipeline Expansion Project.

The potential environmental impacts identified in this section and the mitigation measures proposed by North Baja and recommended by the FERC and CSLC staffs are summarized in tabular form in Section 5. The summary table classifies each impact as either Class I (significant adverse impact that remains significant after mitigation); Class II (significant adverse impact that can be eliminated or reduced below an issue's significance criteria); Class III (adverse impact that does not meet or exceed an issue's significance criteria); or Class IV (beneficial impact). This table forms the basis for the detailed MMP that would be implemented during construction and operation of the North Baja Pipeline Expansion Project (see Section 2.5).

The conclusions in this EIS/EIR are based on the analysis of the environmental impacts and the following assumptions:

- North Baja would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in Section 2 of this EIS/EIR; and
- North Baja would implement the mitigation measures included in its applications and supplemental submittals to the FERC and the CSLC.

4.1 GEOLOGY

4.1.1 Significance Criteria

An adverse impact on geologic, mineral, or paleontological resources would be considered significant and would require mitigation if:

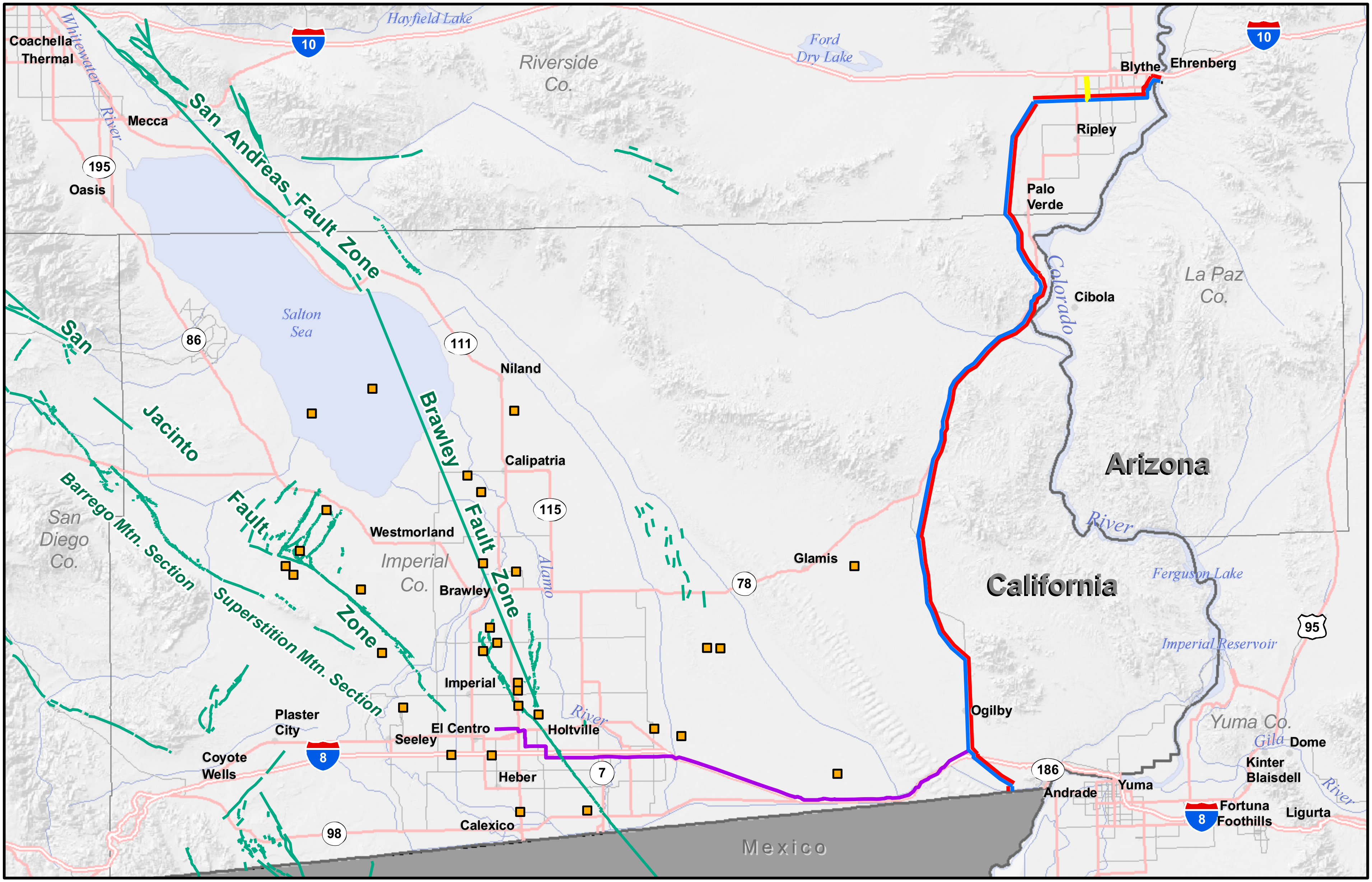
- construction activities or the siting of facilities would worsen existing unfavorable geologic conditions;
- Project construction or operation would preclude or disrupt the development of mineral resources;
- geologic hazards could cause a rupture or failure of the pipeline or cause damage to related facilities that would present a significant threat to public safety; or
- Project construction would result in damage or loss of vertebrate or invertebrate fossils that are considered important by paleontologists and land management agency staff.

4.1.2 Geologic Setting

Pipeline Facilities

The proposed Project is located within the Colorado Desert geomorphic province, commonly referred to as the “low desert” in southern California. The Colorado Desert Province is bounded on the east by the Colorado River, on the south by the Mexican border, and on the west by the Transverse Ranges (Norris and Webb 1990). The northern border lies along the southern edge of the eastern Transverse Ranges, approximately at the San Bernardino-Riverside County line. The Colorado Desert Province is characterized by its arid climate, broad valleys, and low elevation, approximately 250 feet above mean sea level at the Riverside-Imperial County line (Norris and Webb 1990).

The northwesterly structural trends characteristic of most geologic provinces of California are evident in the Colorado Desert Province. The dominant feature of the area is the Salton Trough, located in the southeastern portion of the desert (California Division of Mines and Geology [CDMG] 1992a). The Salton Trough is a tensional feature that has been seismically active in recent time (less than 11,000 years ago), and is marked by several right-lateral strike-slip faults as illustrated on Figure 4.1.2-1. The Salton Trough is a rift valley that is a northwesterly extension of the Gulf of California, which is formed by the East Pacific Rise spreading center. Segments of this spreading center extend up the Gulf and are offset by a series of northwest-trending transform faults, the most northerly of which is the San Andreas. Geologic and geophysical evidence strongly suggests the presence of spreading centers beneath the alluvial blanket within the Salton Trough (CDMG 1977).



Existing North Baja A-Line	Fault*
Proposed North Baja B-Line	Historic Earthquake
Proposed Arrowhead Extension	
Proposed IID Lateral	

0 2 4 8 Miles

* USGS Quaternary Fault and Fold Database

Figure 4.1.2-1
North Baja Pipeline Expansion Project
Principal Faults of the Colorado Desert Province and
Seismic Activity Near the Project Area

A review of existing documents (U.S. Geological Survey [USGS] 1973), including North Baja's construction reports for the A-Line, indicates that bedrock would not likely be encountered along the B-Line and Arrowhead Extension routes except in the vicinity of MP 29.5 of the B-Line, where blasting is anticipated in exposed bedrock comprising intrusive volcanic material overlain by pyroclastic rocks. Other than this isolated area of exposed bedrock, the proposed B-Line route is typically underlain by Quaternary (1.6 million years ago to present) alluvium, colluvium, and terrace deposits, which consist of unconsolidated to poorly consolidated gravel, sand, and silt (CDMG 1977, 1999b). Further details are found in the Geologic Hazards Study (see Appendix J).

The eastern portion of the proposed IID Lateral in the vicinity of the Algodones Dunes is underlain by wind-blown/aeolian deposits consisting of unconsolidated to poorly consolidated sand and silt size material (CDMG 1977). The entire dune chain is migrating southeast in response to strong northwesterly winds that occur in the area, especially in the late winter and spring (Norris and Webb 1990). The East Mesa and Imperial Valley are underlain by Tertiary (66 to 1.6 million years ago) and Quaternary sedimentary rocks composed mainly of sandstones, clays, and lake deposits. Alluvial and terrace deposits form deep soils above these rock features (Morton 1977).

The geologic and physiographic conditions likely to be encountered during construction of the proposed Project are identified by milepost in Table 4.1.2-1.

Aboveground Facilities

All aboveground facilities associated with the B-Line and Arrowhead Extension would be in areas where the surficial geology comprises Quaternary unconsolidated alluvium, colluvium, and terrace deposits. The facilities associated with the IID Lateral would be underlain by similar materials, along with recent aeolian sand deposits of the Algodones Dunes.

Pipe Storage and Contractor Yards

The four proposed pipe storage and contractor yards would be on unconsolidated Quaternary alluvial and colluvial materials. Three of these yards were used during construction of the A-Line; the remaining yard located near MP 43.5 of the IID Lateral was used for similar purposes in the past.

Impact and Mitigation

Construction and operation of the proposed pipeline and aboveground facilities would not materially alter the geologic conditions of the Project area. Effects from construction could include disturbances to the natural topography along the right-of-way and at aboveground facilities due to grading and trenching activities. Along small portions of the right-of-way, natural topographic slope and contours would be temporarily altered by the small-scale grading of the construction right-of-way that is necessary to provide a level and safe work surface for equipment. After completion of construction, North Baja would restore topographic contours and drainage conditions as closely as feasible to their preconstruction condition.

TABLE 4.1.2-1

Geologic and Physiographic Conditions Crossed by the North Baja Pipeline Expansion Project Facilities

Mileposts	Geologic Formation or Stratigraphic Unit (Geologic Age)	Blasting Anticipated [a]	Topography and Elevation Range [b]
B-Line			
0.0 to 12.0	Younger alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Broad flat urbanized area, elevation ranges from 250 to 340 feet above mean sea level (amsl).
12.0 to 26.2	Younger and older alluvial, colluvial, and wash deposits (Quaternary and Tertiary). The older deposits consist of poorly consolidated silts, sands, and gravels.	No	Generally flat terrain with some badlands, elevation ranges from 240 to 340 feet amsl.
26.2 to 26.7	Sedimentary clastic rocks (Tertiary) consisting of non-marine clastic rocks and volcanic conglomerates.	No	Uneven terrain along the base of the Palo Verde Mountains, elevation ranges from 230 to 250 feet amsl.
26.7 to 28.5	Alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Uneven terrain along the base of the Palo Verde Mountains, elevation ranges from 230 to 300 feet amsl.
28.5 to 31.0	Alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated or moderately consolidated sand, gravel, and silt; near MP 29.0, intrusive volcanic bodies (Tertiary) composed of andesite, dacite, or latite porphyry, which may be overlain by pyroclastic rocks and flows of acidic to intermediate composition in isolated locations.	Yes	Uneven terrain along the base of the Palo Verde Mountains, elevation ranges from 230 to 300 feet amsl.
31.0 to 31.2	Alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Uneven terrain along the base of the Palo Verde Mountains, elevation ranges from 235 to 300 feet amsl.
31.2 to 31.6	Bouse Formation consisting of sedimentary and Volcanic rocks (Tertiary). Sedimentary rocks consist of brackish water limestone, siltstone, and sandstone. A 1-foot-thick layer of volcanic tuff may be present at the surface, masking the underlying sedimentary rocks.	No	Uneven terrain along the base of the Palo Verde Mountains, elevation ranges from 250 to 300 feet amsl.
31.6 to 33.5	Sedimentary rocks that alternate between clastic rocks (Tertiary) and younger alluvial/colluvial deposits (Quaternary). Clastic rocks consist of non-marine clastic rocks and volcanic conglomerates. Alluvial and colluvial deposits consist of unconsolidated sand, gravel, and silt.	No	Uneven terrain with some badlands near the base of the Palo Verde Mountains, elevation ranges from 250 to 340 feet amsl.
33.5 to 36.2	Younger alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Generally flat area crossing Milpitas Wash, elevation ranges from 360 to 400 feet amsl.
36.2 to 57.5	Younger and older alluvial deposits (Quaternary and Tertiary) consisting of unconsolidated clay, silt, sand, and gravels occurring primarily as valley fill and streamwash deposits.	No	Generally flat ascending terrain at the base of the Chocolate Mountains, elevation ranges between 400 to 1,230 feet amsl.
57.5 to 71.0	Older Alluvium (Tertiary) partly dissected largely unconsolidated poorly sorted silt, and gravel of alluvial fans, and desert pavement areas.	No	Generally flat descending terrain with some badlands, elevation ranges between 350 to 700 feet amsl.
71.0 to 79.8	Younger alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Broad flat alluvial valley in the Salton Trough, sand dunes present from MPs 75.5 to 79.8, elevation ranges from 200 to 700 feet amsl.
Arrowhead Extension			
0.0 to 2.1	Younger alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Broad flat urbanized area, elevation ranges from 250 to 340 feet amsl.
IID Lateral			
0.0 to 0.5	Younger alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Broad flat alluvial valley, elevation ranges from 200 to 700 feet amsl.

TABLE 4.1.2-1 (cont'd)

Geologic and Physiographic Conditions Crossed by the North Baja Pipeline Expansion Project Facilities

Mileposts	Geologic Formation or Stratigraphic Unit (Geologic Age)	Blasting Anticipated [a]	Topography and Elevation Range [b]
0.5 to 7.6	Extensive sand dune deposits (Quaternary) consisting of unconsolidated to poorly consolidated sand and silt.	No	Wind-blown sand dunes, elevation ranges from 50 to 300 feet amsl.
7.6 to 27.0	Younger alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Broad flat alluvial valley, elevation ranges from 200 to 700 feet amsl.
27.0 to 45.7	Younger alluvial, colluvial, and wash deposits (Quaternary) consisting of unconsolidated sand, gravel, and silt.	No	Broad flat alluvial valley in the Salton Trough, elevation ranges from 0 to 50 feet amsl.

[a] May change based on conditions encountered in the field.

[b] Elevation range limited to specific area of proposed modifications.

Blasting is only anticipated to be necessary along the B-Line near MP 29.5 because that was the only area requiring blasting during construction of the A-Line. The area surrounding MP 29.5 is uninhabited desert, with no nearby residences or other development. However, cultural resources features are nearby. The blast would be limited to the trenchline and blasting mats would be employed to keep fly-rock from leaving the construction work area. All blasting activities would be conducted in strict compliance with North Baja's Blasting Specifications (see Appendix I). To avoid injury to personnel and damage to structures or other features like existing pipelines, North Baja's Blasting Specifications stipulates that the blasting contractor must prepare site-specific blasting plans and procedures for review and approval by North Baja. All blasting activities would be conducted under the supervision of a California Licensed Blasting Technician. Blasting procedures would be in accordance with Federal, State, and local regulations regarding use, storage, and transport of explosives; safety; and environmental protection. Blasting would not be required in other areas because most of the pipeline route is underlain by unconsolidated to poorly consolidated alluvial deposits or soft, weathered sedimentary clastic rocks.

Because three of the proposed pipe storage and contractor yards were previously disturbed during construction of the A-Line, and the remaining yard along the IID lateral was previously used for similar purposes, any improvements at these sites would be minimal. Activities at the yards would consist of minor grading and surfacing, and would not materially alter the existing geologic conditions of the Project area or subject the facilities to an increased threat from geologic hazards.

Construction of the pipeline and associated aboveground facilities would minimally disturb shallow geologic deposits; therefore, the potential for construction activities or the siting of facilities to worsen existing unfavorable geologic conditions would be less than significant.

4.1.3 Mineral Resources

Pipeline Facilities

The B-Line would cross within approximately 2 miles of known mineral resources such as gold, manganese, copper, and sand and gravel deposits (CDMG 1977). Mineral resources zones (MRZ), assigned by the CDMG classify the portion of the B-Line in Riverside County as MRZ-4, which is defined as having no known mineral occurrences. The CDMG has not classified MRZs within Imperial County (California Department of Conservation [CDC] 2004).

Gold deposits have been found in the southeastern area of Imperial County. The Potholes and Picacho Mining Districts are in the southeastern part of Imperial County, about 50 miles east of El Centro, California and 20 miles north of Yuma, Arizona. The CDC has identified Principal Mineral-Producing Localities (clay and gypsum) in southern Imperial County, although neither is in the immediate vicinity of the proposed Project (CDMG 1999).

The BOR operates a rock quarry between the Cibola NWR and SR 78. The A-Line was rerouted to avoid the quarry and lies 0.2 mile to the east outside of the formation that supplies quarry material. The B-Line would follow the same alignment. According to the BOR, the quarry is used intermittently to supply material for erosion control.

Other mineral resource/mining areas within the Project area include the Hodge Mine, the Mule Mountains Mining District, two California mineral estates, the Old Channel Mine shaft, the Mesquite Gold District, and the Cargo Muchacho Gold Mining District. The B-Line would cross the northwestern corner of the mineral estate located in Township 12S, Range 20E, Section 16, and west of the Old Channel Mine shaft near MP 49.7. Neither of these resources is active. The other mineral estate, located in Township 11S, Range 20E, Section 16, is 3,000 feet west of MP 42.5. Table 4.1.3-1 summarizes these mineral resources in relation to the B-Line.

TABLE 4.1.3-1 Mineral Resources and Mining Areas in the Vicinity of the North Baja Pipeline Expansion Project		
Facility	Nearest B-Line Milepost [a]	Distance from Pipeline (miles)
Hodge Mine	7.0	1.6
Mule Mountains Mining District	21.0	5.8
Bureau of Reclamation Quarry	30.0	0.2
California Mineral Estate	42.5	0.6
California Mineral Estate	49.7	0.0
Old Channel Mine Shaft	49.7	0.3
Mesquite Gold District	53.0	4.4
Cargo Muchacho Gold Mining District	71.0	3.9

[a] No mineral resources or mining areas were identified within the vicinity of the Arrowhead Extension or the IID Lateral.

Aboveground Facilities

None of the aboveground facilities associated with the proposed Project would be within 1 mile of identified mineral or quarry resources.

Pipe Storage and Contractor Yards

None of the proposed pipe storage or contractor yards associated with the proposed Project would be within 1 mile of the identified active mineral resources.

Impact and Mitigation

Pipeline projects have the potential to affect the production of mineral resources by restricting mineral production activities in the immediate vicinity of the pipeline right-of-way or precluding future expansion. However, because the Project would not be near any active mines, impacts on mining activities are not expected. The Project would not affect the BOR's quarry integrity or operation, nor would quarry operations have negative effects on the pipeline, given the distance the pipeline is located from current and future quarry operations. The potential for the pipeline to be affected by the weight of loaded quarry trucks crossing the pipeline would be minimal because the trucks travel from the quarry west to SR 78 and do not cross the pipeline to the east. Additionally, the pipeline would be designed to accommodate the same loads that SR 78 is designed to accommodate according to CalTrans specifications. North Baja would notify the BOR before construction in the vicinity of the quarry. Because of the proximity of the BOR quarry to SR 78 and the presence of unsuitable material to the north and south of current quarrying activities, future expansion would not be affected by the pipeline. Moreover, because no additional active mines or quarries would be within 1,000 feet of the North Baja Pipeline Expansion Project, the potential for construction and operation of the Project to preclude or disrupt the development of mineral resources would be less than significant.

4.1.4 Geologic Hazards

Pipeline Facilities

Geologic hazards are natural physical conditions that may result in damage to the land and structures, or injury to people. Such hazards typically include seismicity (active faults, earthquakes, and soil liquefaction), landslides, subsidence, and karst terrain (sinkholes and other water-formed/solution features).

Active Faults – Several active faults or seismic zones lie within the Project area. The primary seismic hazard to the proposed pipeline facilities would be moderate ground shaking from earthquakes associated with the San Andreas Fault System. Major elements of the San Andreas Fault System in the vicinity of the Project include the San Jacinto and Imperial Fault Zones (USGS 2006). The Brawley Fault Zone lies between the Coachella section of the San Andreas Fault Zone and the Imperial Fault Zone, and transfers slip movements to the Imperial Fault Zones. According to the 1997 Uniform Building Code, the seismic hazard potential along the B-Line increases from north to south from a seismic zone rating of 3 from MP 0.0 to approximately MP 45.0, to a seismic zone rating of 4 throughout the Imperial Valley. The Arrowhead Extension, which connects with the B-Line at MP 7.4, has a seismic zone rating of 3. The IID Lateral has a seismic zone rating of 4 for its entire length (International Conference of Building Officials 1998). The increase in seismic hazard in the Imperial Valley is attributable to seismic activity in the Salton Trough. Consequently, the southern portion of the B-Line route would be in a region that is more seismically active than the northern portion.

Seismic events greater than or equal to a magnitude of 5.0 in the vicinity of the proposed pipeline routes that have been historically recorded are listed in Table 4.1.4-1 and shown on Figure 4.1.2-1. The largest recorded magnitude earthquake occurred in 1979, with a reported magnitude of 7.0. This earthquake occurred approximately 9.4 miles from MP 31.0 of the IID Lateral. As shown on Figure 4.1.2-1, seismic activity predominantly occurs along the Imperial and Brawley Fault Zones.

Regionally, seismicity has been attributed to active faulting along various fault zones and/or faults. Active faults in the vicinity of the proposed pipeline facilities include the southern portion of the San Andreas Fault Zone, the Brawley Fault Zone, and the Imperial Fault Zone. The B-Line, Arrowhead Extension, and associated aboveground facilities would not cross or be near any faults or Alquist-Priolo Earthquake Fault Zones (Hart 1997). However, the IID Lateral would cross the Imperial Fault and Imperial Fault Zone. The active faults near the IID Lateral are listed in Table 4.1.4-2; the fault locations are shown on Figure 4.1.2-1. The Geologic Hazards Study presents details of the probability of seismic activity for relevant faults and areas (see Appendix J).

The Imperial Fault is a right-lateral strike-slip fault that stretches roughly from north to south. The IID Lateral would cross this fault at approximately MP 40.0. This fault is very active, with several instances of surface rupture and trigger slips on record. The largest of the events to date include surface ruptures during a 6.4 magnitude event in 1979 and a 6.9 magnitude event in 1940. The 1940 event caused the All-American Canal to shift more than 14 lateral feet, while the 1979 event caused a lateral shift of 22 inches (Southern California Earthquake Data Center [SCEDC] 2005). Events similar to the 1979 event are likely to occur every 30 to 40 years. Events similar to the 1940 event have an average return interval of about 700 years. Surface rupture is common along this fault, even during smaller events (SCEDC 2005).

The Superstition Hills and Superstition Mountain sections of the San Jacinto Fault Zone lie northwest of the western end of the proposed IID Lateral. They represent the most seismically active faults in southern California, with significant earthquakes (greater than Magnitude 5.5) and a slip rate between 1.0 and 5.0 millimeters per year (USGS 2006).

TABLE 4.1.4-1

Earthquakes within 62 Miles of the North Baja Pipeline Expansion Project with Magnitudes Greater Than or Equal to 5.0

Source [a]	Shortest Distance from Pipeline (miles) [b, c]	Milepost	Year	Magnitude	Maximum Intensity [d]	Latitude	Longitude
B-Line and Arrowhead Extension							
EQH	18.6	0.0	1906	6.0	VIII	33.000	115.000
IID Lateral							
EQH	0.4	43.0	1915	6.25	VIII	32.800	115.500
SCEDC	1.8	27.0	1935	5.3		32.79	115.26
USGS	1.8	45.0	1979	5.5		32.93	115.54
DNA	1.9	43.0	1977	5.0		32.820	115.470
SCEDC	1.9	44.0	1940	5.15		32.83	115.5
SCEDC	1.9	44.0	1940	5.18		32.83	115.5
USGS	1.9	43.0	1977	5.0		32.82	115.47
USGS-C	1.9	43.0	1915	6.2		32.8	115.5
USGS-C	1.9	27.0	1935	5.0		32.9	115.22
SCEDC	2.1	13.0	1951	5.94		32.74	115.03
USGS-C	2.1	26.0	1935	5.0		32.9	115.2
CDMG	2.3	29.0	1917	5.5	VII	32.800	115.300
SCEDC	2.5	45.0	1953	5.5		32.77	115.54
USGS-C	2.5	27.0	1938	5.0		32.9	115.22
SCEDC	3.2	44.0	1940	6.9		32.85	115.5
USGS	3.2	45.0	1979	5.2		32.9	115.55
SCEDC	3.9	44.0	1940	5.41		32.86	115.5
USGS-C	3.9	29.0	1917	5.5		32.8	115.3
USN	4.6	35.0	1940	5.5	VII	32.700	115.400
SCEDC	5.0	45.0	1934	5.9		32.77	115.6
USGS	5.0	45.0	1979	5.1		32.91	115.53
SIG	5.4	39.0	1940	6.7		32.700	115.500
ROT	8.7	45.0	1953	5.7		32.833	115.667
USGS	9.4	31.0	1979	7.0		32.63	115.33
PAS	9.7	27.0	1935	5.0		32.900	115.217
PAS	9.7	27.0	1935	5.0		32.900	115.217
PAS	9.7	27.0	1938	5.0		32.900	115.217
PAS	10.8	30.0	1979	6.6		32.614	115.318
CDMG	12.2	45.0	1928	5.0		32.900	115.700
EQH	13.5	44.0	1930	5.0	VIII	33.000	115.500
USN	13.5	44.0	1955	5.4	VII	33.000	115.500
ROT	13.6	38.0	1961	5.1		32.567	115.450
DNA	14.3	45.0	1979	6.1		33.013	115.555
PAS	17.0	45.0	1951	5.6		32.983	115.733
CDMG	18.7	38.0	1918	5.0	VI	32.500	115.500
CDMG	18.7	38.0	1921	5.0	IV	32.500	115.500
DNA	18.7	38.0	1927	5.75		32.500	115.500
PDE	20.5	45.0	1979	5.0		33.100	115.550
PAS	22.0	45.0	1950	5.4		33.117	115.567
PAS	22.0	45.0	1950	5.5		33.117	115.567
PAS	22.3	45.0	1946	5.4		33.000	115.833
PAS	23.2	45.0	1971	5.1		33.034	115.821
PDE	23.2	45.0	1987	6.7		33.010	115.840
PDE	24.2	45.0	1987	6.5	VI	33.083	115.775

TABLE 4.1.4-1 (cont'd)

Earthquakes within 62 Miles of the North Baja Pipeline Expansion Project with Magnitudes Greater Than or Equal to 5.0

Source [a]	Shortest Distance from Pipeline (miles) [b, c]	Milepost	Year	Magnitude	Maximum Intensity [d]	Latitude	Longitude
PDE	24.6	21.0	1987	5.4	V	32.390	115.310
GS	24.8	17.0	1999	4.9		32.369	115.224
USN	27.3	44.0	1935	5.0	VI	33.200	115.500
SIG	28.2	11.0	1980	6.4	V	32.300	115.000
PDE	28.2	15.0	1978	5.0	VI	32.290	115.081
PDE	30.5	15.0	1999	5.2		32.269	115.138
USN	30.9	18.0	1954	5.1	VI	32.300	115.300
PAS	31.3	45.0	1942	5.5		33.233	115.717
USN	31.7	45.0	1957	5.0	VI	33.200	115.800

[a] Sources were identified by a query search conducted by the National Geophysical Data Center, a division of the National Oceanic and Atmospheric Administration.

[b] The approximate midpoint of the B-Line was used as the center of the radial search. The latitude and longitude coordinates for this location are north 33°07'30" and west 114°52'52", respectively.

[c] "Shortest Distance from Pipeline" is equal to the shortest distance between the earthquake epicenter and the pipeline in miles.

[d] "Maximum Intensity" indicates the maximum Modified Mercalli Intensity (MMI) value associated with the earthquake, which is another measurement of perceptible ground movement. MMI indicates the effects actually experienced by people in terms of 12 levels of intensity (USGS 1989). Intensity level V is "felt by nearly everyone; many awakened; some dishes windows broken; unstable objects overturned; pendulum clocks may stop." Intensity level VI is "felt by all, many frightened; some heavy furniture moved; a few instances of fallen plaster; damage slight." However, magnitude using the Richter scale was used whenever possible.

CDMG = California Division of Mines and Geology; DNA = Decade of North American Geology; EQH = Earthquake History of the United States, Gutenberg and Richter; GS = U.S. Geological Survey, Denver, Colorado; PAS = Pasadena, California; PDE = Preliminary Determination of Epicentres; ROT = Rothe, J.P; SIG = Catalog of Significant Earthquakes; USN = U.S. Network Catalog; SCEDC = Southern California Earthquake Data Center (USGS and CalTech) www.data.scec.org; USGS = Earthquake Hazards Program, 1973-2005 Database Search (http://neic.usgs.gov); USGS-C = Earthquake Hazards Program, 1735-1974 CA Database Search (http://neic.usgs.gov)

TABLE 4.1.4-2

Active Faults in the Vicinity of the IID Lateral

Name and Geometry[a]	Distance from Pipeline (miles)	Milepost	Length (miles)	Slip Rate (in/yr)	Rank[b]	Mmax[c]	Maximum Fault Displace-ment (feet)	Peak Horizontal Acceleration (% gravity; g)	U S. Department of Transportation Classification	R.I.[d]	Endpt. N[e]	Endpt. S[f]	Comment
Imperial Fault Zone (rl-ss)	0.0	40.0	38.5	0.31	M	7.0	15	0.84	A	79	-115.57: 32.91	-115.17: 32.47	Slip rate is based on study by Thomas and Rockwell (1996). Maximum magnitude based on M 6.9 event that occurred in 1940 (Ellsworth 1990).
Brawley Fault Zone (rl-ss)	10.8	44.0	26.0	0.39	P	6.4	0.6	0.55	B	24	-115.71; 33.35	-115.51; 32.96	Slip rate and fault length reported by the Working Group on California Earthquake Probabilities (WGCEP) (1995).
Superstition Hills Section of the San Jacinto Fault Zone (rl-ss)	9.0	45.0	13.5	0.06	P	6.6	2.1	0.71	A	250	-115.84; 33.01	-115.64; 32.89	Slip rate and fault length reported by WGCEP (1995). Maximum magnitude based on 1987 Superstition Hills Earthquake (Wells and Coppersmith 1994).
Superstition Mountain Section of the San Jacinto Fault Zone (rl-ss)	11.8	45.0	14.0	0.08	M	6.6	1.2	0.64	A	500	-115.92; 33.99	-115.70; 32.89	Slip rate based on Gurrola and Rockwell (1996). Maximum magnitude earthquake based on 1968 Borrego Mountain Earthquake (Wells and Coppersmith 1994).

[a] (rl-ss) = right-lateral strike-slip.

[b] M = moderately constrained slip rate; P = poorly constrained slip rate.

[c] Maximum moment magnitude calculated from relationships (rupture area) derived by Wells and Coppersmith (1994).

[d] R.I. = recurrence interval.

[e] Endpt. N = North endpoint of the fault in latitude and longitude.

[f] Endpt. S = South endpoint of the fault in latitude and longitude.

Source: Petersen et al. 1996. Probabilistic Seismic Hazard Assessment for the State of California.

The Brawley Fault Zone is a right-lateral strike-slip fault trending in a north-south direction. The IID Lateral would not cross this fault; the nearest distance to the fault in proximity to the lateral would be 10.8 miles at MP 44.0. This fault complex appears to be connected with the Imperial Fault Zone, and ruptures seem to have occurred synchronously between the two systems during previous earthquakes. The area is characterized by high heat flow due to the local thinness of the crust. Because of the high heat flow and the rapid rate of slip, faults in the area are probably prone to aseismic creep, which is relatively slow movement along a fault that does not trigger seismic events greater than micro-earthquakes.

Because of the complexity of the fault system at work, this area is also prone to earthquake swarms, such as those that coincided with the ground movement in 1975, breaking the surface trace for a distance of 6 miles with a vertical displacement of almost 8 inches (SCEDC 2005).

Earthquakes – The pipeline facilities would be located in a seismically active region. The potential for strong ground accelerations in the immediate vicinity of the proposed B-Line and Arrowhead Extension is generally low; however, the potential increases along the IID Lateral as it approaches El Centro. To quantify seismic hazards in any given region, the USGS developed maps of earthquake shaking hazards under the National Seismic Hazard Mapping Project (updated 1996). These maps are used to assess probabilistic seismicity and provide information used to create and update design provisions of building codes in the United States. These codes provide design standards for buildings, bridges, highways, and utilities such as natural gas pipelines. Values on these seismic hazard maps are expressed as a percentage of gravity (acceleration of a falling object due to gravity) - the higher the value, the greater the potential hazard.

As shown on Figure 4.1.4-1, there is only a 10 percent chance that the peak ground acceleration along the B-Line or Arrowhead Extension would exceed 10 to 20 percent of gravity in 50 years. The IID Lateral would cross through areas of 20 to 30 percent of gravity in the Algodones Dunes, with steep increases up to greater than 80 percent of gravity at the terminus of the pipeline in El Centro (see Figure 4.1.4-1) (CDMG 1996, USGS 1996).

Soil Liquefaction – Secondary seismic effects triggered by strong ground shaking are often more serious than the shaking itself. The most damaging secondary seismic effect is commonly soil liquefaction, a physical process in which saturated, non-cohesive soils temporarily lose their bearing strength when subjected to strong and prolonged shaking. As loose granular soils are shaken, they tend to contract, which may lead to positive pore pressures that can result in a loss of shear strength. Liquefaction typically occurs when the water table is less than 50 feet below ground surface and the soils are predominantly unconsolidated. Soils most prone to liquefaction are poorly graded, or in other words have a uniform grain size. Sand boils and fissures are a common sign of liquefaction. Sand boils and fissures form when saturated sediment below the surface is pushed to the surface by elevated pore water pressure. Soil liquefaction can also lead to other ground failures, including settlement and lateral spreading.

Within the Palo Verde Valley, which would include the B-Line between MPs 0.0 to 12.0 and the entire Arrowhead Extension, the depth to groundwater ranges between 9 and 23 feet below ground surface due to the proximity to the Colorado River. This area has been identified as having liquefaction hazard potential by Riverside County. Although groundwater is less than 50 feet from the surface in the vicinity of the Cibola NWR in Imperial County, seismicity is minimal. Where the proposed pipeline route crosses the Milpitas Wash at MP 36.0, two nearby monitoring wells indicate the depth to groundwater is between 43 and 50 feet. Further south (at about MP 79.0 of the B-Line), the depth to groundwater typically exceeds 50 feet. In the vicinity of the All-American Canal (MP 79.8), the depth to groundwater has been recorded as shallow as 35 feet below ground surface.

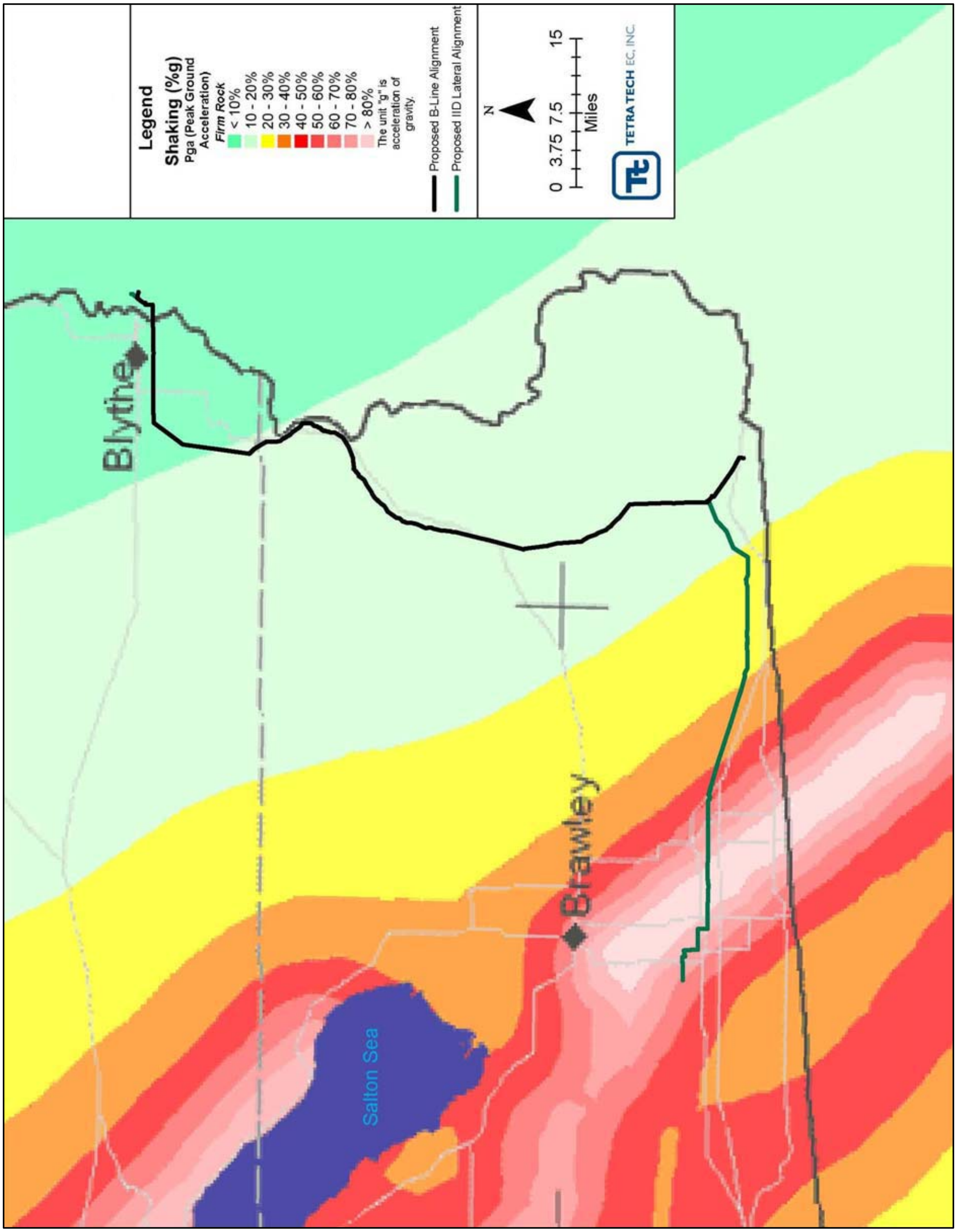


Figure 4.1.4-1
North Baja Pipeline Expansion Project
Probabilistic Seismic Hazard Map

To determine the potential for liquefaction hazards, North Baja conducted a Liquefaction Hazard Evaluation and Mitigation Study before construction of the A-Line. The report provides the results of geotechnical exploration at the Ehrenberg Compressor Station site and along 18th Avenue; analysis of soil borings that were previously placed at the Colorado River and the All-American Canal; identification of seismic sources, Maximum Magnitude Earthquake values, and site acceleration; Uniform Building Code seismic coefficients based on design basis earthquake(s) for the study area; the probability of soil liquefaction; and an estimate of permanent ground subsidence induced from liquefaction. The results are discussed below. In addition, the Geologic Hazards Study (see Appendix J) includes a seismic hazards study and a study of liquefaction potential that were conducted for the proposed Project including the IID Lateral. The liquefaction potential study concluded that in addition to the areas identified along the B-Line, there are areas of locally high liquefaction potential along the IID Lateral. In particular, areas along the East Mesa (between MPs 8.0 and 27.0) and in the Imperial Valley (between MPs 27.0 and 45.7) would have a locally or generally high potential for liquefaction based on soil type and potential for ground shaking (see Appendix J). The liquefaction potential identified for the B-Line along the western portion of 18th Avenue would also be expected along the route of the Arrowhead Extension.

Along the route of the IID Lateral, one well has been identified where the groundwater level was within 50 feet of the surface. The well is located in the Algodones Dunes, near MP 9.0, where soils are primarily unconsolidated sand and silt. Although groundwater is not near the surface in the Imperial Valley, liquefaction and sand boils were observed during earthquakes of the late 1970s and early 1980s (Bennett et al. 1979, 1984).

Landslides – Landslides involve the downslope movement, under gravity, of masses of soil and rock material. Landslides can be triggered by ground shaking, such as earthquakes, or heavy precipitation events. Generally, landslides occur on slopes composed of sedimentary or unconsolidated materials. Sedimentary rocks are particularly susceptible to landslides because they commonly contain relatively less competent beds of clays and other fine-grained rocks interbedded with more competent beds of sand and gravel.

Slumping is another slope instability hazard that involves the downward and outward sliding of a large mass of more consolidated material along a curved, usually concave upward, shearing plane. The slump block, or the main block that has broken off, often breaks into smaller mini-slump blocks as it slides downslope. Landslide hazards, like earthquake hazards, are more concentrated in California. No significant landslides were observed during a site reconnaissance North Baja conducted to evaluate geologic hazards along the pipeline route. According to information obtained using the USGS hazard mapping and analysis tools, the B-line, Arrowhead Extension, and IID Lateral routes generally do not cross steep terrain prone to landslides or slumping (USGS 1996). With the exception of the edge of the Palo Verde Mesa (MPs 11.6 to 11.8) discussed below, the slopes that would be crossed do not exceed 25 percent gradient and have negligible potential for slope instability.

The banks of the Colorado River at the B-Line crossing location may be susceptible to failure during an earthquake or flooding. The B-Line would cross numerous drainages containing alluvial material. These drainages are subject to debris flow and flash flood occurrence during sporadic heavy rainfall for the region. The Palo Verde Peak area contains moderate to steep slopes that contain blocky, volcanic rock outcrops and boulders on the surface. These outcrops are a potential source of falling and rolling boulders. Rock falls are most likely to occur during strong earthquakes or large storms that may loosen boulders on the surface. However, the proposed pipeline does not appear to be at risk from rock falls because the route does not traverse sloping terrain exceeding 25 percent gradient, nor is the route immediately at the foot of steep slopes.

From MPs 11.6 to 11.8, the B-Line would cross the terrace edge of the Palo Verde Mesa. The terrace slope is generally at a 25 percent gradient, but slopes of 30 to 35 percent gradient are locally present along the edge of the mesa. This terrace slope is susceptible to water erosion if significant runoff occurs down the slope. The base of the terrace is densely vegetated. The terrace slope to the south appears to have been eroded by several small washes that formerly drained a larger drainage basin to the west. The drainage is now generally directed to a gulley cutting through the lower terrace about 4,000 feet to the south of MP 11.7. There are several sand dunes at the base of the mesa to the south, giving the appearance of a hummocky topography. The IID Lateral would cross the Salton Trough, where topographic relief is generally low. Because the majority of the terrain that would be crossed by the Project is relatively flat, significant landslides or associated hazards are not anticipated.

<u>Subsidence</u> – Subsidence, the loss of surface elevation due to removal of subsurface support, is one of the most diverse forms of ground failure ranging from small or local collapses to broad regional lowering of the earth's surface. Excessive groundwater withdrawal can lead to subsidence. Within the agricultural areas of the Palo Verde and Imperial Valleys, canal water (and not groundwater) is the primary source of irrigation water. Therefore, the potential for future subsidence associated with groundwater withdrawal would be minimal. Additionally, because of the relationship to water table decline, this type of subsidence is generally a slow process occurring over broad areas and would not be likely to damage the pipeline.

<u>Karst Terrain</u> – Features such as sinkholes, fissures, caves, and underground drainage that form by dissolution of limestone, dolomite, gypsum, or other soluble rocks are considered karst terrain. These features can be hazardous due to associated ground failures. The geologic conditions required for karst development generally are not present within the areas that would be crossed by the Project. One segment of the B-Line that would cross the southern portion of the Palo Verde Mountains (MPs 31.2 to 31.6) would likely encounter rock types from the upper section of the Bouse Formation. The Bouse Formation is identified as containing a basal limestone unit that is overlain by several hundred feet of thinly interbedded clay, silt, and sand. However, the presence of karst features in this area is not likely, and associated hazards are not anticipated. There are no karst features in the vicinity of the Arrowhead Extension or the IID Lateral.

<u>Active Sand Dunes</u> – While not considered a geologic hazard, active sand dunes can either expose or bury pipelines as the dunes laterally migrate. The Algodones Sand Dunes would be crossed by the IID Lateral between MPs 0.0 and 7.9. The dunes were formed from lake bottom deposits from Lake Cahuilla and are an active feature that moves at a rate of approximately 6 to 25 centimeters per year (BLM 2003). Winter winds are from the northwest, but often reverse to the southeast in summer. The stronger winter winds are slowly pushing the dune system southeastward.

Aboveground Facilities

Unlike buried pipelines, aboveground structures are more likely to be damaged by ground shaking rather than surface displacement. Results from the Liquefaction Hazard Evaluation and Mitigation Study North Baja performed in 2001 for the A-Line indicate that a major earthquake of magnitude 7 or greater originating on the San Andreas or Imperial Faults would create a high probability for soil liquefaction at the Ehrenberg Compressor Station site. However, underlying ground improvements were implemented at the site by densification of liquefiable soil using compaction grouting or stone columns.

The only aboveground facility in the sand dunes area would be a valve located along the IID Lateral at MP 7.6 between the All-American Canal and Interstate 8 in an area of relatively stable sands and away from actively moving dunes.

The Imperial Fault Zone is the nearest fault zone to any valve and is approximately 11 miles from valve #3 on the IID Lateral. Table 4.1.4-3 summarizes the fault zones in relation to the nearest proposed valve locations, identifies the nearest upstream and downstream valves, lists the distance to the nearest home or business and town or city, and provides the estimated response time for valve closure.

The estimated response time for valve closure is complicated by the fact that the IID Lateral is a single-purpose pipeline that would serve only the El Centro Generating Station. When the IID chooses to use the gas transported by the IID Lateral, it would make a sudden large demand on gas volume, which would temporarily substantially drop the gas pressure in the pipeline. Like the existing North Baja system, a precipitous pressure drop would trigger an alarm at North Baja's Gas Control Center, which is staffed 24 hours a day. The operator would have 10 minutes in which to determine whether the pressure drop is caused by something other than a rupture and either override the alarm or initiate a shutdown. If neither of these actions is taken by the operator within 10 minutes, or if line pressure decreases to a pre-determined threshold before 10 minutes, the valve would close automatically.

Pipe Storage and Contractor Yards

The yards proposed for pipe storage and contractor use would be in relatively flat areas. With the possible exception of minor grading and surface disturbance, the topography and soils at these sites would not be disturbed. In addition, these facilities would be temporary and operated only as long as needed for construction. Therefore, no significant impact on geologic resources associated with the use of pipe storage and contractor yards would be anticipated. Furthermore, none of the activities at these facilities would be likely to trigger geologic hazards.

Impact and Mitigation

Seismicity includes active faults, ground shaking, and soil liquefaction, and is the primary geologic hazard that could affect the proposed Project facilities. Seismic events in the vicinity of the Project are centered on fault activity in the Salton Trough. Several faults and fault zones are proximal to the proposed IID Lateral, the most significant of which is the Imperial Fault Zone (CDMG 1992b), which would be crossed at approximately MP 40.0.

In addition to surface displacement, ground shaking and resulting soil liquefaction can also occur with fault activity and could be a potential hazard to the pipeline facilities. Several faults in the vicinity of the Project area have the potential for generating earthquakes that could cause strong ground motions. A major earthquake of magnitude 7.0 or greater originating on the San Andreas or Imperial Faults could affect the Project area within the design life of the proposed facilities. Damage to buried pipelines is most often caused by the differential movements of geologic material as opposed to shaking itself.

Results from the Liquefaction Hazard Evaluation and Mitigation Study North Baja performed for the A-Line indicate that a major earthquake of magnitude 7.0 or greater originating on the San Andreas or Imperial Faults would create a high probability for soil liquefaction at the Arizona side of the Colorado River crossing and on the western portion of the 18th Avenue alignment. The liquefaction potential identified for the B-Line along the western portion of 18th Avenue would also be expected along the route of the Arrowhead Extension.

Permanent ground subsidence induced from liquefaction was estimated to be 0 to 4.8 inches, and surface ground disruption, cracking, or sand boil formation is not likely to occur. The potential for lateral spreading is low, except for the Arizona side of the Colorado River, where about 1 inch of permanent lateral displacement could occur in addition to vertical ground subsidence.

TABLE 4.1.4-3

Earthquake Fault Zones in Relation to the Nearest Proposed IID Lateral Valve Locations

Name	Milepost	Distance from Pipeline (miles)	Nearest Upstream Valve	Nearest Downstream Valve	Distance Between Valves (miles) [a]	Distance to Nearest Home or Business (feet)	Distance to Nearest Town/City (miles)	Town/City	2004 Population	Estimated Response Time for Valve Closure (minutes)
Superstition Hills Section of the San Jacinto Fault Zone	11.7	13.5	Valve #3	Valve #4	11.5	2,000	3.8	El Centro	38,350	10
Superstition Mountain Section of the San Jacinto Fault Zone	11.7	16.4	Valve #3	Valve #4	11.5	2,000	9.5	Brawley	22,255	10
Brawley Fault Zone	11.7	13.6	Valve #3	Valve #4	11.5	0	0	Brawley	22,255	10
Imperial Fault Zone	11.7	11.3	Valve #3	Valve #4	11.5	50	2.3	El Centro	38,350	10

[a] Distances are measured between the upstream and downstream valves except for valves near the end of the pipeline, where distances are between the valve nearest the fault and the nearest upstream or downstream valve.

To mitigate the potential for liquefaction, North Baja incorporated the recommendations of the Liquefaction Hazard Evaluation and Mitigation Study conducted for the A-Line into the design for the proposed Project. At the Colorado River, liquefiable soils would be avoided by use of the HDD crossing method. As discussed above, the liquefaction study included as part of the Geologic Hazards Study conducted for the proposed Project concluded that in addition to the areas identified along the B-Line, there are areas of locally high liquefaction potential along the IID Lateral (see Appendix J). In particular, areas along the East Mesa (between MPs 8.0 and 27.0) and in the Imperial Valley (between MPs 27.0 and 45.7) would have a locally or generally high potential for liquefaction based on soil type and potential for ground shaking (see Appendix J). Lateral spreading near the Alamo River and at canal banks may exceed the 0 to 6 inches estimated for other areas. As recommended in the study, North Baja would design and construct the IID Lateral to be earthquake resistant using the estimated Peak Ground Velocity and Permanent Ground Displacement values given in Appendix J.

To further mitigate and reduce potential damage to the proposed facilities from earthquakes, North Baja's facility design would comply with Federal standards outlined in Title 49 CFR Part 192. This code governs the construction and operation of natural gas pipelines, greatly reducing the potential risk of damage. The pipelines and associated facilities would be designed using the *Guidelines for the Design of Buried Steel Pipe* (American Lifelines Alliance 2001), *Guidelines for the Seismic Design and Assessment of Natural Gas and Liquid Hydrocarbon Pipelines* (Pipeline Research Council International, Inc. 2004), applicable building codes, and/or other similar recognized seismological engineering standards. The engineering design drawings for the entire Project in California would be certified by a California-registered civil/structural engineer, and would comply with the latest edition of the California Building Code.

Empirical reviews of historical earthquakes demonstrate that pipelines are not prone to failure due to earthquakes. A 1996 study of earthquake performance data for steel transmission lines and distribution supply lines operated by SoCalGas over a 61-year period found that post-1945 arc-welded transmission pipelines in good repair have never experienced a break or leak during a southern California earthquake. These pipelines are the most resistant type of piping, vulnerable only to very large and abrupt ground displacement (e.g., severe landslides), and are generally highly resistant to traveling ground wave effects and moderate amounts of permanent deformation (O'Rourke and Palmer 1996).

North Baja has committed to perform a site-specific seismic evaluation as part of its detailed design phase for the Project. This evaluation would determine the engineering/design solutions that are appropriate to mitigate against the hazard of seismic displacements along the Imperial Fault. The seismic evaluation would determine recommended design fault displacements for the pipeline design specifications. North Baja would develop a computer model to determine the soil-pipe interaction with the proposed applied displacement. The model would evaluate various combinations of pipe wall thickness and pipe grade to determine which pattern yields the best performance under displacement conditions. The design may also incorporate additional mitigation methods if necessary. Examples of additional design features that have been employed on pipelines in earthquake-prone regions include:

- trapezoidal trench design using loose granular backfill (most common);
- trapezoidal trench design using geofoam as backfill;
- installation of the pipe within a culvert;
- increasing the wall thickness or pipe grade;
- specialty in-line fittings to accommodate pipe movement;

- installation of the pipe above ground on elevated supports or pipe hangers;

- modification of the pipeline configuration;

- installation of isolation/automatic shutdown valves on either side of the fault crossing; and

- modification of emergency response procedures.

North Baja would provide a copy of the final design for the Imperial Fault crossing, as well as any related geotechnical information, to the CSLC and the FERC before construction of the IID Lateral. The final design would also address any measures necessary to mitigate for liquefaction hazards.

The strength and ductility of the pipeline facilities would further reduce the potential impacts associated with displacement caused by surface faulting, liquefaction, and mass wasting. In the unlikely event of a pipeline rupture caused by a seismic event (or any other cause), North Baja would implement its emergency response procedures, as described in Section 4.14.2. All facilities would be designed with remote manual pipeline block valves with automatic shutdown capability that are programmed to sense pipeline ruptures and to isolate a specific pipeline valve section in the case of a catastrophic rupture in that valve section. As shown in Table 4.1.4-3, the estimated response time for valve closure is 10 minutes. In the event of an emergency, North Baja currently has a procedure in place to utilize the Spokane, Washington operations center as an emergency call center. However, the call center in Spokane is currently in the process of being changed to Redmond, Oregon. By the time the proposed Project would be in operation, the Redmond center would likely be operational. There would also be a corporate call center in Calgary, Alberta, Canada. The purpose of the call centers in the first few minutes following a rupture is to mobilize company resources to secure the incident site and notify local first responders of the incident. The incident site is surrendered to local first responders upon their arrival. Procedures are also in place to notify Sempra of any incident occurring on the North Baja facilities so that it can respond appropriately with regard to its facilities and jurisdictions in Mexico. Further discussion of North Baja's proposed operation, maintenance, and safety controls is presented in Sections 2.6 and 4.14.

Because North Baja would design and construct the pipelines and associated facilities in accordance with the guidelines, Federal standards, and building codes described above, and the empirical studies as cited above indicate that the ductility of pipelines makes them highly resistant to rupturing as a result of earthquakes or moderate displacement, the potential for seismic-related events to cause a rupture or failure of the pipeline or cause damage to related facilities would not present a significant threat to public safety except in the case of the most severe earthquake displacement across the pipeline route. In case of severe earthquake displacement across the pipeline route, the threat to public safety would be minimized through the use of remote manual block valves with automatic shutdown capability that would isolate the rupture, and automated detection and notification of first responders of the incident; therefore, the potential for a seismic event to cause a rupture or failure of the pipeline or cause damage to related facilities that would present a significant threat to public safety would be less than significant.

As previously discussed, a review of USGS documents indicates that the majority of the Project does not cross landslide-prone areas. The B-Line would parallel the A-Line, which was rerouted to avoid the Palo Verde Mountain foothills, eliminating a landslide hazard identified at that location. With the exception of the Palo Verde Mesa that would be crossed by the B-Line between MPs 11.6 and 11.8, neither the B-Line, the Arrowhead Extension, nor the IID Lateral cross steep terrain that was identified as having a high potential for landslides or slumping.

In areas of steep terrain, the potential hazard can be reduced by creating a stable and/or level right-of-way work area during the grading operation and implementing restoration practices in the CM&R Plan (see Appendix E). To prevent a potential instability of the B-Line at the Palo Verde Mesa, the pipeline and the grade immediately to each side of the pipeline would be laid back to no more than 30 percent gradient for the estimated 60-foot-high lower terrace slope. North Baja anticipates minor cuts would be needed to accommodate this grade transition. In other areas of steep terrain, North Baja would:

- restore damaged slope breakers on the existing permanent easement where the B-Line parallels the existing A-Line;
- install slope breakers to control surface water on the new construction right-of-way;
- install trench breakers to control groundwater flow in the pipe trench;
- route discharge of surface water away from the slope breakers, and divert or collect surface water coming onto the construction right-of-way to pipes in an outflow below the slope;
- adhere strictly to erosion control and revegetation measures required by Federal, State, and local authorities;
- bury the pipeline in a deeper trench than normal or place armor above it in areas of potential debris flow hazards; and
- monitor geotechnical conditions for signs of mass wasting, and respond appropriately to any indications of instability.

If these measures are followed, the potential for impacts from slope stability hazards to cause a rupture or failure of the pipeline or cause damage to related facilities that would present a significant threat to public safety would be less than significant.

Although the banks of the Colorado River may be susceptible to failure during an earthquake or flooding, use of the HDD method to install the pipeline crossing would place the pipeline well below and away from the potential areas of bank instability. Therefore, mass wasting of the banks would not affect the pipeline.

The IID Lateral would cross the Algodones Sand Dunes. As previously discussed, active sand dunes can either expose or bury pipelines as the dunes laterally migrate. CalTrans has stabilized a segment of the dunes and actively manages the area to keep Interstate 8 open to vehicle traffic. The IID Lateral would be just south of the CalTrans-managed area and is, therefore, somewhat protected from sand dune migration. North Baja would bury the IID Lateral 6 feet deep between MPs 2.7 and 5.7, which includes the area most susceptible to blowing/shifting sands and pipeline exposure. If sand depth were to increase slightly over the pipeline, this would increase its protection from the elements and from vandalism. Therefore, the potential for sand dunes to cause a rupture or failure of the pipeline or cause damage to related facilities that would present a significant threat to public safety would be less than significant.

As discussed in Section 4.14, North Baja would prepare and implement an Operation and Maintenance Plan and an Emergency Response Plan in accordance with the requirements in Title 49 CFR Part 192. Implementation of North Baja's Operation and Maintenance Plan would further reduce the potential threat from the facilities to public safety during their operation.

4.1.5 Paleontological Resources

The significance of paleontological remains can be determined by the types of fossils, the geologic age of the remains, the assemblage association (the unique biological association or organisms), the lithology and age of the rock units, and feature rarity or uniqueness. A paleontological resource can be considered to have scientific or educational value if it:

- provides important information on the evolutionary trends among organisms, relating living inhabitants of the earth to extinct organisms;
- provides important information regarding development of biological communities or the interaction between botanical and zoological biota;
- demonstrates unusual or spectacular circumstances in the history of life;
- is in short supply and in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation and is not found in other geographic locations;
- is recognized as a natural aspect of our national heritage;
- lived before the Holocene (less than 11,000 years ago); and
- is not associated with an archaeological resource, as defined in Section 3(1) of the Archaeological Resources Protection Act of 1979 (16 USC § 470bb[1]).

A fossil specimen would be significant if it is: (1) identifiable; (2) complete; (3) well preserved; (4) age diagnostic; (5) useful in environmental reconstruction; (6) a type or topotypic specimen; (7) a rare taxon; or (8) part of a diverse assemblage.

Pipeline Facilities

Before construction of the A-Line, paleontological literature and museum archival reviews for previously recorded fossil sites in the vicinity of the A-Line were undertaken. All known geological and paleontological literature was reviewed for references to fossils. In addition, museum archival reviews were conducted at the University of California Museum of Paleontology (UCMP) at Berkeley, the San Diego Natural History Museum, and the San Bernardino County Museum. The UCMP at Berkeley is considered the primary repository for fossils in the State of California, and the UCMP collections are considered the most comprehensive of all California institution collections.

Detailed information on the stratigraphy of the area was obtained from numerous geological publications. The geology in the vicinity of the proposed right-of-way has been mapped or described extensively, including Brown (1923), Dibblee (1954), Strand (1962), Jennings (1967), Metzger et al. (1973), Loeltz et al. (1975), Morton (1977), and Stone (1990). Dibblee (1954), Metzger et al. (1973), and Morton (1977) provided the most comprehensive and detailed accounts.

A field survey was then undertaken by North Baja to supplement the literature and museum archival reviews. The objective of the field survey was to verify that sensitive rock units occurred at mapped points, to document the condition of recorded fossil sites, to identify potentially unrecorded fossil sites, and to determine if special mitigation measures need to be implemented.

With the exception of the Colorado River and All-American Canal crossings, the B-Line would be 25 feet from the A-Line for its entire length and cross the same rock types/formations that have the potential to contain significant paleontological resources. While most geologic formations have the potential to contain fossils, those containing vertebrate fossils are considered to be the most significant. Vertebrate fossils tend to be rare and fragmentary, and thus have greater scientific importance than the more common invertebrate and plant fossils.

The B-Line would cross stratigraphic units that could contain paleontological resources, including Holocene and Pleistocene alluvial sediments, Pliocene marine sediments of the Bouse Formation, Miocene fanglomerates, and Early Tertiary volcanic and volcaniclastic rocks. Rock formations older than the Early Tertiary volcanics typically consist of igneous and metamorphic type rocks not known to contain fossils. The Arrowhead Extension would extend from MP 7.4 of the B-Line north for 2.1 miles and cross the same stratigraphy as found in the first 11 miles of the A-Line.

The regional stratigraphy along the IID Lateral route can be summarized into four sedimentary units proceeding from east to west between MPs 0.0 and 45.7. The oldest of these, between MPs 0 and 2.0, consists of Pleistocene non-marine sedimentary deposits locally derived from the flanks of the Mesozoic crystalline (granitic) rocks of the Cargo Muchacho Mountains. Between MPs 2.0 and 7.6 west of these arkosic sediments, are aeolian (windblown) sands designated “Qs” on the State geologic maps. West of the dune fields between MPs 7.6 and 27.6 is a 20-mile-long stretch of alluvial deposits that include fluvial as well as some aeolian/fluvial deposits (dune sands redeposited by streams). This heterogeneous unit denoted as “Qal” or Quaternary alluvium is mapped as “Recent,” but Pleistocene intervals are present at about 4 to 6 feet below the surface.

The most remarkable unit identified along the proposed IID Lateral is the lacustrine sands and silts of ancient Lake Cahuilla between MPs 27.6 and 45.7. In addition to these fine-grained arenites there are some intervals rich in clay and even occasional beach sands marking the gradual retreat of this large lake occupying the center of the Salton Trough. Mapped as “Pleistocene and Recent,” Lake Cahuilla sediments date back as far as the Pliocene epoch up to 4 million years in the past in the deeper parts of the trough. A thick rich soil profile sits atop these predominantly fine-grained arenites and the entire interval is nearly completely unconsolidated.

Based on the literature and museum archival review, field survey, the paleontological sensitivity for the stratigraphic units crossed by the proposed pipeline facilities was determined. The potential for fossils to occur based on paleontological sensitivity along the B-Line, Arrowhead Extension, and IID Lateral is summarized by milepost in Table 4.1.5-1.

As shown in Table 4.1.5-1, Pleistocene older alluvium and the Pliocene Bouse Formation units both have a moderate potential to contain fossils. These units would be crossed only by the B-Line. The remaining stratigraphic units that would be crossed by the pipelines have a low potential for fossils.

The paleontological monitoring conducted by qualified personnel during the construction of the A-Line revealed a very limited presence of paleontological resources (see Table 4.1.5-2). Of the several areas identified during preconstruction analysis as moderate sensitivity along the A-Line, only about a 1-mile-long stretch from MPs 28.1 to 29.1 yielded a single significant paleontological find. Areas of older Pleistocene alluvium, and potentially of moderate sensitivity identified from MPs 11.5 to 22.3 yielded no paleontological materials. Other areas of older Pleistocene alluvium between MPs 35.0 and 75.2 yielded only occasional paleontological materials and no significant finds.

TABLE 4.1.5-1

Paleontological Sensitivity of Stratigraphic Units Found Along the North Baja Pipeline Expansion Project

Mileposts	Stratigraphic Unit	Potential for Fossils
B-Line		
0.0 – 11.5	Holocene alluvium	low
11.5 – 22.3	Pleistocene older alluvium	moderate
22.3 – 25.2	Holocene alluvium	low
25.2 – 25.8	Pleistocene older alluvium	moderate
25.8 – 26.0	Holocene alluvium	low
26.0 – 26.6	Miocene fanglomerate	low
26.6 – 27.0	Holocene alluvium	low
27.0 – 27.3	Miocene fanglomerate	low
27.3 – 27.6	Holocene alluvium	low
27.6 – 28.2	Pliocene Bouse Formation	moderate
28.2 – 28.5	Holocene alluvium	low
28.5 – 29.2	Pliocene Bouse Formation	moderate
29.2 – 29.9	Early Tertiary volcanic rocks	low
29.9 – 30.2	Pliocene Bouse Formation	moderate
30.2 – 31.2	Early Tertiary volcanic rocks	low
31.2 – 31.6	Pliocene Bouse Formation	moderate
31.6 – 32.6	Miocene fanglomerate	low
32.6 – 32.8	Holocene alluvium	low
32.8 – 35.8	Miocene fanglomerate	low
35.8 – 36.3	Holocene alluvium	low
36.3 – 75.2	Pleistocene older alluvium	moderate
75.2 – 79.8	Holocene alluvium	low
Arrowhead Extension		
0.0 – 2.1	Holocene alluvium	low
IID Lateral		
0.0 – 2.0	Pleistocene alluvium	low
2.0 – 7.6	Dune sands	low
7.6 – 27.6	Quaternary alluvium	low
27.6 – 45.7	Quaternary lacustrine sands	low

TABLE 4.1.5-2

Paleontological Resources Discovered During Construction of the A-Line

Mileposts	Results of Paleontological Monitoring	Significant Paleontological Find
25.7	Unidentified Holocene specimen (bone fragment)	No
27.2	Corals and calcareous algae in Bouse limestone	No
27.7-28.1	Turritelidae fossils, brachiopods, ostracods, foraminifera amphistegina, echinoids, and algae	No
27.7-28.8	Slabs of chert hosting marine invertebrates	No
27.9	Large fossil log in Bouse Formation limestone spoil pile	No
28.1	Slabs of Bouse Formation limestone hosting kummel form echinoids	No
28.1-28.2	Echinoid (sea urchin) fossils of probably Miocene age (14 to 15 million years before present)	Yes
28.1-28.2	Small echinoid crowns, barnacles plates, and shark teeth	No
28.6	Chert/limestone pebbles; crinoids, corals, bryozoans, and sand shark teeth	No
28.5-29.0	Brachiopod in Bouse Formation	No
29.1	Paleozoic brachiopod	No
33.1	Petrified wood specimen	No
33.2	Paleozoic fossiliferous crinoidal limestone	No
32.1-35.0	Limestone nodule with Paleozoic fossil corrals	No
41.5	Two petrified wood specimens in Pleistocene older alluvium	No
45.2-45.8	Marine fossils in carbonate pod (coral, bryozoa, crinoid ossicles)	No

Aboveground Facilities

Construction of valve #5 at MP 28.0 on the proposed B-Line would have the potential to affect paleontological resources because it would occur in close proximity to where a significant paleontological find was discovered during construction of the A-Line. No other aboveground facility sites would be in areas anticipated to have significant paleontological resources.

Pipe Storage and Contractor Yards

The four pipe storage and contractor yards would not be located in areas anticipated to have significant paleontological resources.

Impact and Mitigation

Paleontological resources could be affected by construction of the pipeline and associated aboveground facilities as well as by the resulting increased public access to these resources. Without mitigation, ground disturbance during construction could cause adverse impacts on paleontological resources. The FLPMA of 1976 and NEPA mandate the protection of significant paleontological resources on federally owned or controlled lands. The CEQA also requires the protection of paleontological resources in California. Direct physical modifications of paleontological resources could occur during Project construction by activities such as grading or trenching. Indirect impacts on fossil beds could result from erosion caused by slope regrading, vegetation clearing, and unauthorized collection. Avoidance of significant fossil localities is the most effective mitigation method. If avoidance is not possible, scientific excavation to recover fossil materials would reduce the impacts to an acceptable level.

Based on the archival research and monitoring undertaken during the construction of the A-Line, monitoring of the B-Line construction by a paleontologist would be warranted between MPs 27.0 and 29.1, where the outer edge of the Bouse Formation would be crossed. This milepost range includes the location of valve #5. Because the stratigraphic unit that would be crossed by the Arrowhead Extension has a low potential to yield paleontological resources, construction impacts on paleontological resources would not be expected.

The four stratigraphic units that would be crossed by the IID Lateral (Pleistocene alluvial fan deposits, dune sands, Quaternary alluvium, and Quaternary lake deposits) have low potential to yield paleontological resources. Therefore, the construction of the IID Lateral is unlikely to impact such resources.

To address potential impacts on paleontological resources resulting from pipeline construction, North Baja developed a Paleontological Resource Mitigation and Monitoring Plan (PRMM Plan) for the North Baja Pipeline Expansion Project (see Appendix K). The PRMM Plan includes a summary of the literature and museum archival review, field survey results, and assessment of potential impacts on paleontological resources. The PRMM Plan also includes Project-wide and site-specific mitigation and monitoring measures and curation and reporting procedures that would be implemented during construction. Some pertinent measures contained in North Baja's PRMM Plan include:

- availability of a qualified Project paleontologist to be called to the Project area to respond to construction-related issues;
- training of construction personnel and EIs regarding the possibility that fossil resources may be encountered during construction;

- granting of authority for the EI to temporarily halt construction to allow for assessment by the Project paleontologist and implementation of mitigation procedures if warranted;

- salvage of significant fossils as determined necessary by the Project paleontologist; and

- protocol for curation and repository storage of fossils.

Following construction, North Baja's Project paleontologist would prepare a final paleontological report. The final report would be distributed to the FERC, the CSLC, the BLM, the BOR, the Cibola NWR, and other interested parties.

In summary, the overall potential to recover salvageable paleontological resources from the surficial units along the proposed B-Line is low, with the exception of the area between MPs 27.0 and 29.1. During construction, North Baja would conduct paleontological monitoring within this area, which includes the proposed site of valve #5. Similarly, the overall potential to recover salvageable paleontological resources from the surficial units along the proposed IID Lateral route is low. North Baja would conduct spot monitoring between MPs 27.6 and 46.0 of the IID Lateral unless excavation unearths coarse beach intervals or thicker sand/gravel lenses. If these characteristics are exposed, continuous monitoring would be conducted. Because the potential for paleontological resources to occur within the Project area is low, and North Baja would implement its PRMM Plan, which specifies paleontological monitoring in areas identified as having moderate potential for paleontological resources, the potential that construction of the Project would result in damage or loss of vertebrate or invertebrate fossils that are considered important by paleontologists and land management agency staff would be less than significant.

4.1.6 No Project Alternative

Under the No Project Alternative, the FERC would deny North Baja's application for a Certificate and a Presidential Permit amendment, the CSLC would deny North Baja's application for an amendment to its right-of-way lease across California's Sovereign and School Lands, and the BLM would deny North Baja's application to amend its existing Right-of-Way Grant and obtain a Temporary Use Permit for the portion of the Project on Federal lands. The No Project Alternative means that the Project would not go forward and the Project-related facilities would not be installed. Accordingly, none of the potential impacts on geologic, mineral, or paleontological resources identified for the construction and operation of the proposed Project would occur.

Because the proposed Project is privately funded, it is unknown whether North Baja would fund another energy project in California. However, should the No Project Alternative be selected, the energy needs identified in Section 1.1 would likely be addressed through other means, such as through other LNG or natural gas-related pipeline projects. Such projects may result in potential environmental impacts of the nature and magnitude of the proposed Project as well as impacts particular to their respective configurations and operations; however, these impacts cannot be predicted with any certainty at this time.